

PATENT ABSTRACTS OF JAPAN

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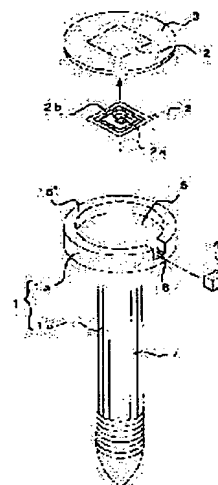
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(54) METHOD FOR MOUNTING IC TAG ON METAL OBJECT AND MARKER WITH BUILT-IN IC TAG

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a mounting method for enabling sufficient communication even at the time of mounting an IC tag coping with a frequency which is easily affected by a metal on a metal object.

SOLUTION: The IC tag provided with an antenna communication with a reader without contacting is mounted on a metallic structure. The metallic structure 1 is provided with a recessed part 5 capable of housing the IC tag 2 and a notch 6 communicating with the inside of the recessed part and an outer side face is provided on the peripheral wall 5' of the recessed part. The IC tag is integrally held on the back surface of a plate 3 closing the opening part of the recessed part, the plate is fixed to the opening part of the recessed part and at least the IC tag is positioned higher than the bottom of the notch and housed and mounted.



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CLAIMS

[Claim(s)]

[Claim 1] It is the wearing approach to the metal object of IC tag characterized by to prepare the notch which is the approach of equipping the metal structure with IC tag equipped with the antenna which can communicate by the reader and non-contact, and prepares the crevice which can contain IC tag to the metal structure, and opens the lateral surface for free passage in this crevice to the peripheral wall of the crevice, to locate said IC tag at least more highly than the bottom of said notch, and to carry out hold wearing.

[Claim 2] The marker with a built-in IC tag characterized by having had the metal marker body which formed the notch which opens the lateral surface for free passage in this crevice in the peripheral wall of the crevice which can contain IC tag equipped with the antenna which can communicate by the reader and non-contact, and said IC tag, and its crevice, having located said IC tag more highly than the bottom of said notch, and equipping with it.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the technique which carries out laying-under-the-ground wearing of the IC tag which equips a metal object with a RFID function about a RFID (Radio Frequency Identification) technique, and is made identifiable.

[0002]

[Description of the Prior Art] In the marker for displaying existence of a pile showing the boundary of land, the gas pipe currently laid underground in the earth, a signal cable, water-and-sewage tubing, etc. on surface of the earth, identification information is memorized and the thing equipped with IC tag which can communicate with a reader by non-contact exists. This IC tag receives supply of power from a reader by wireless, transmits the identification information memorized with that power to a reader, and

can check various information now easily.

[0003] However, since the endurance over an impact etc. is needed, these markers consist of metal material, they dedicate IC tag into the metal, and have structure which covers with the plate made from a nonmetal with which names, such as a laying-under-the-ground object, etc. were written from on the. For the reason, the about 100 to 200kHz low frequency in which the radio frequency of IC tag cannot receive effect of metaled comparatively easily was used, and thereby, the antenna section in IC tag could not be formed with a thin film, but had the fault of becoming expensive.

[0004]

[Problem(s) to be Solved by the Invention] Then, although it is possible to use the radio frequency and IC tag of about 13MHz use used as 1/several [which could form the antenna section with the thin film, and also described the price above / of IC tag of low frequency use] prices Said frequency tended to be influenced of metaled, and when laying-under-the-ground wearing was carried out, the communication link of it was not completed in the marker which consisted of metal material in consideration of the endurance over an impact etc. at all, but it had the problem that storage information could not be read with a reader.

[0005] The place which this invention was made in view of the trouble which the above-mentioned Prior art has, and is made into the purpose is to offer the wearing approach whose communication link is fully possible, even if it equips a metal object with IC tag corresponding to a frequency which is easy to be influenced of metaled. Moreover, other purposes are to offer a metal marker with an IC tag built-in [equipped with the antenna section by the thin film].

[0006]

[Means for Solving the Problem] The technical means which this invention provided in order to attain the above-mentioned purpose are the approaches of equipping the metal structure with IC tag equipped with the antenna which can communicate by the reader and non-contact, and the notch which prepares the crevice which can contain IC tag to the metal structure, and opens the lateral surface for free passage in this crevice to the peripheral wall of the crevice prepares, and it is characterized by to locate said IC tag at least more highly than the bottom of said notch, and to carry out hold wearing. In addition, the frequency of IC tag is not limited to 13.56MHz, but the target effectiveness should just be demonstrated.

[0007] The notch which opens for free passage the crevice formed in the above-mentioned metal structure, and a peripheral face A part of upper peripheral wall shall be completely excised from the base of this crevice to upper limit at least. It is making a peripheral wall bias the core of 1, the gestalt which carries out two or more notch formation, or a crevice to the core of the structure, and specifically forming at it the slot which opens the inside and outside of a crevice for free passage, and the crevice and notch to which notching of a part of peripheral wall was carried out are mentioned for the gestalt of one etc. That is, the magnitude of a notch is determined according to the sensibility to need and the reinforcement of a marker.

[0008] Moreover, the notch which opens a crevice and the peripheral face of the structure for free passage is buried by nonmetal material, for example, synthetic-resin material, and a crevice is sealed by fixing a plate. Although the gestalt which became independent in itself is sufficient as the filler which buries the notch, it is good also as a gestalt which forms in one the filler which buries said notch part on the plate which closes opening of a crevice. Furthermore, the above-mentioned notch has penetrated and may lack not only the peripheral wall of the perimeter of a crevice but a pars basilaris ossis occipitalis. Moreover, any, such as a mix type the installation type which carries out adhesion immobilization on the peripheral wall top face of the perimeter of a crevice or the fitting type inserted in a crevice, an installation type, and fitting type, are sufficient as the plate which closes opening of a crevice. IC chip is arranged in nothing and the center in the square shape of a thin film, and, as for IC tag held in a crevice, an antenna is formed around an outside with a thin film.

[0009] Moreover, the metal marker having IC tag is equipped with the metal marker body which formed

the notch which opens the lateral surface for free passage in this crevice in the peripheral wall of the crevice which can contain IC tag equipped with the antenna which can communicate by the reader and non-contact, and said IC tag, and its crevice, and considers it as the configuration which said IC tag is located more highly than the bottom of said notch, and equips with it. The above-mentioned marker is not limited to that by which the claw part (leg) was formed in the head bottom in which a crevice is formed, but may be stuck and fixed to an object etc.

[0010] Since the notch which reaches the peripheral face of a crevice deeper than the location of IC tag and the structure is prepared in the metal structure with which hold wearing of the IC tag is carried out according to the above-mentioned means, a path is secured as an electric wave or a field. Even if metal material is equipped with IC tag corresponding to a frequency which is easy to be influenced of metaled by that cause, it can communicate with a reader certainly.

[0011]

[Embodiment of the Invention] Hereafter, an example of the gestalt of operation of this invention is explained based on a drawing. Drawing 1 shows the condition of equipping with IC tag to the marker (rivet) used as marks, such as a land boundary and a civil work, and the marker body of metal [one], the plate with which IC tag and 3 consist of nonmetal material in 2, and 4 are the fillers made from a nonmetal among drawing.

[0012] The marker bodies 1 are metal material, such as stainless steel and iron, and notching formation of the notch (slot) 6 which it is formed in the cross-section abbreviation T typeface by which claw part 1b was formed in the inferior surface of tongue of head 1a equipped with the IC tag 2 at one, and the crevice 5 of the depth which floats and can hold the IC tag 2 in head 1a is formed, and reaches the peripheral wall around the crevice 5 from the inside of a crevice 5 at a peripheral face is carried out. For the outer diameter of head 1a, the thickness of 24mm and head 1a is [the die length of 6mm and claw part 1b of the magnitude of this marker body 1] 70mm. Claw part 1b is embedded in the earth, and fixes a marker, and the slot 7 which makes placing smooth is formed in the peripheral face.

[0013] IC chip 2a is arranged in nothing and the center in the square shape of a thin film, and, as for the IC tag 2 held in the above-mentioned crevice 5, antenna 2b is formed around the outside with the thin film. And in order for this IC tag 2 to float and to hold it from the pars basilaris ossis occipitalis of said crevice 5, it sticks and fixes to the rear face of the plate 3 made from a nonmetal, and this IC tag 2 fits in and fixes plate 3 self in a crevice 5. Thereby, the IC tag 2 is supported in the condition of having floated several mm from the base of a crevice 5.

[0014] By nonmetal material, such as synthetic-resin material, a plate 3 is formed in disc-like [of the outer diameter of said head 1a and *****], sticks the IC tag 2 on the location corresponding to the crevice 5 of the plate 3 rear face, and fixes to it. And the name 8 grade which displays the contents of the laying-under-the-ground object etc. is written by the front face of this plate 3. In addition, the shape of an outside attachment cap which is not limited to the top face of peripheral wall 5' of a crevice 5 by the gestalt which carries out installation immobilization so that it may illustrate, inserts in while fitting in inside a crevice 5, and covers shape of cap and peripheral wall 5' etc. has as this plate 3.

[0015] The above-mentioned notch 6 is formed so that a predetermined width-of-face (for example, 2mm) notch, and the interior of a crevice 5 and the outside of peripheral wall 5' may open peripheral wall 5' for free passage in respect of the same with the base of the above mentioned crevice 6. And this notch 6 is buried with the filler 4 which consists of nonmetal material, such as synthetic-resin material, and it is made to be sealed by fixing of the above mentioned plate 3 in the crevice 5. In addition, this filler 4 may be constituted in a plate 3 and one.

[0016] Drawing 4 shows other gestalten of the above-mentioned notch 6, this notch 6' is the gestalt which cut not only peripheral wall 5' but pars-basilaris-ossis-occipitalis 5'' of a crevice 5 together, and lacked it, and notch 6' is similarly buried with a filler 4 with having described above. Since other configurations are the same as that of the above mentioned gestalt of operation, explanation is omitted. Drawing 5 is the gestalt which kept spacing in the hoop direction and carried out a large number

formation of the notch 6 formed in peripheral wall 5' of a crevice 5, and many notch parts are buried with a filler 4 like the gestalt of said operation.

[0017] Drawing 6 shows other examples of a marker body, and when the configuration of head 9a of the marker body 9 is very larger than the IC tag 2 with which is a flat-surface substantially regular quadrangle and the area of the head 9a moreover equips, the crevice 10 in which the IC tag 2 is held carries out arrangement formation in the location near a peripheral face, without forming in the center position of head 9a. Because, the distance which passes along a notch 11 also becomes short, and the shorter one can lessen [the distance from the IC tag 2 to the peripheral face of head 9a] effect of metaled.

[0018] drawing 7 -- the modification of a notch 6 -- being shown -- a flat surface -- the flat surface formed to the circular head 12 -- it is only distance's L biasing the core O of a crevice 13 rightward from core O' of a head 12, and forming the circular crevice 13, and the notch 14 which reaches a peripheral face by formation of a crevice 13 can be formed in coincidence. And width of face of a notch 14 can be extensive-*****ed by adjusting the amount of bias of the core which forms a crevice 13.

[0019] Information can be read without being influenced by the IC tag 2 with which the marker 1 is equipped of the metal which constitutes a marker by making the reader 15 which an operator carries approach or (about 5mm) contact the top face of a marker 1, in order to read in a metal marker with a built-in IC tag of the above-mentioned configuration the information memorized by IC tag. This is because the field which returns to the antenna of a reader 15 and the IC tag 2, a notch 6, and a reader 15 is secured as shown in drawing 2 .

[0020] Below, the experimental result of the marker of the above-mentioned configuration is explained. IC tag used for a [experiment use set] experiment and a reader install horizontally IC tag simple substance (condition which does not have metal material on the outskirts) whose frequency is 13.56MHz, and the set which can communicate is used for them even if they separate a reader from this IC tag front face 50mm along the apparent vertical top passing through the core of the IC tag.

With having been shown in [experiment 1] drawing 1 , the metal marker with which the notch is not formed in the peripheral wall with the same configuration is equipped, where IC tag whose frequency is 13.56MHz is described above. Even if it brought close until it contacted the top face of such a marker in the reader, the communication link was not completed and reading was not completed.

When the metal marker which has the notch which showed the [experiment 2] above-mentioned IC tag to drawing 1 was equipped and the reader was close brought like the experiment 1, even if the distance from a marker top face to a reader separated 5mm, it could communicate and information was able to be read. In addition, you may make it support of the above mentioned IC tag 2 fix through the spacer which consists of a nonmetal by several mm in thickness at the bottom of not only sticking on the rear face of a plate 3 but the crevice 5. Or as long as the notch is extended under the antenna section of IC tag, you may make it located in the bottom of a crevice. What is necessary is just the form where the path of a field as shown in drawing 2 is securable in short.

[0021]

[Effect of the Invention] By the configuration according to claim 1, even if the wearing approach to the metal object of IC tag of this invention is a radio frequency which is easy to be influenced of metaled, the communication link with IC tag and a reader of it is attained, and it can make cheap IC tag available at a metal object. Moreover, by the configuration according to claim 2, even if it equips a metal marker with IC tag corresponding to a radio frequency which is easy to be influenced of metaled, a communication link becomes possible, and a marker with a built-in IC tag can be manufactured cheaply.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing a gestalt example of operation of the marker with a built-in IC tag concerning this invention.

[Drawing 2] a busy condition is shown -- it is a notching side elevation a part.

[Drawing 3] It is the same section notching top view.

[Drawing 4] It is the sectional view showing the modification of a notch.

[Drawing 5] Other examples of a notch are shown, (a) is a front view and (b) is a cross-sectional view.

[Drawing 6] It is the perspective view showing the modification of a marker.

[Drawing 7] The modification of a notch is shown, (a) is a cross-sectional view and (b) is drawing of longitudinal section.

[Description of Notations]

1 -- Marker body 1a -- Head

1b -- Claw part 2 -- IC tag

2b -- Antenna 3 -- Plate

4 -- Filler 5 -- Crevice

5a -- Peripheral wall of a crevice 6 -- Notch

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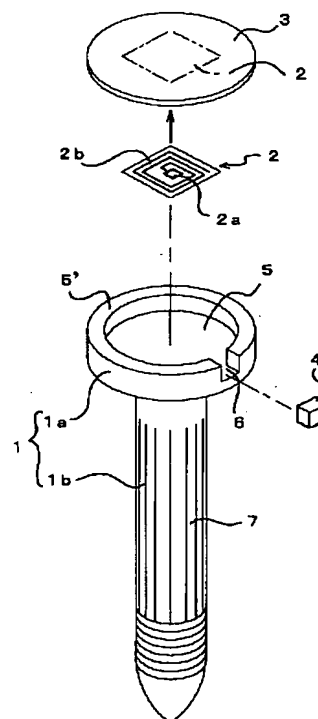
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(54) 【発明の名称】 ICタグの金属物への装着方法及びICタグ内蔵マーカー

(57) 【要約】

【課題】 金属の影響を受けやすい周波数対応のICタグを、金属物に装着しても、十分に通信が出来る装着方法を提供することにある。

【解決手段】 読取装置と非接触で通信できるアンテナを備えたICタグを、金属製構造物に装着する方法であって、金属製構造物1にICタグ2を収納可能な凹部5を設け、且つその凹部の周壁5'に該凹部内と外側面を連通する切欠き6を設け、前記ICタグは前記凹部の開口部を閉鎖するプレート3の裏面に一体的に保持し、プレートを凹部の開口部に固着して、少なくともICタグを前記切欠きの底よりも高く位置させて収容装着する。



(2)

【特許請求の範囲】

【請求項1】 読取装置と非接触で通信できるアンテナを備えたICタグを、金属製構造物に装着する方法であって、金属製構造物にICタグを収納可能な凹部を設け、且つその凹部の周壁に該凹部内と外側面を連通する切欠きを設け、前記ICタグは、少なくとも前記切欠きの底よりも高く位置させて収容装着することを特徴とするICタグの金属物への装着方法。

【請求項2】 読取装置と非接触で通信できるアンテナを備えたICタグと、前記ICタグを収納できる凹部とその凹部の周壁に該凹部内と外側面を連通する切欠きを形成した金属製のマーカー本体とを備え、前記ICタグを前記切欠きの底よりも高く位置させて装着したことを特徴とするICタグ内蔵マーカー。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はRFID (Radio Frequency Identification) 技術に関し、特に金属物にRFID機能を備えるICタグを埋設装着して識別可能とする技術に関する。

【0002】

【従来の技術】土地の境界を示すための杭や、地中に埋設してあるガス管、信号ケーブル、上下水道管等の存在を地表において表示するためのマーカーでは、識別情報を記憶し、読取装置とは非接触で通信できるICタグを備えたものが存在する。このICタグは、読取装置から無線によって電力の供給を受け、その電力で記憶されている識別情報を読取装置に送信し、様々な情報の確認が簡単に行えるようになっている。

【0003】しかし、これらのマーカーは衝撃等に対する耐久性が必要とされるために金属材で構成され、その金属の中にICタグを納めて、その上から埋設物等の名称等が表記された非金属製のプレートにより蓋をする構造となっている。その為、ICタグの無線周波数は比較的金属の影響を受けにくい、約100kHzから200kHzの低周波数が利用されており、これによりICタグ内のアンテナ部は薄膜で形成することができず、高価になるという欠点を有していた。

【0004】

【発明が解決しようとする課題】そこで、アンテナ部を薄膜で形成することができ、又、価格も前記した低周波数利用のICタグの数分の一の価格となる無線周波数、約13MHz利用のICタグを利用することが考えられるが、前記周波数は金属の影響を受けやすく、衝撃等に対する耐久性を考慮して金属材で構成されたマーカーに埋設装着した場合は、全く通信ができず、読取装置で記憶情報を読み取ることが出来ないという問題があった。

【0005】本発明は、上記した従来の技術が有する問題点に鑑みてなされたもので、その目的とするところは、金属の影響を受けやすい周波数対応のICタグを、

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金属物に装着しても、十分に通信が出来る装着方法を提供することにある。又、他の目的は、薄膜によるアンテナ部を備えたICタグ内蔵の金属製マーカーを提供することにある。

【0006】

【課題を解決するための手段】上記目的を達成するために本発明が講じた技術的手段は、読取装置と非接触で通信できるアンテナを備えたICタグを、金属製構造物に装着する方法であって、金属製構造物にICタグを収納可能な凹部を設け、且つその凹部の周壁に該凹部内と外側面を連通する切欠きを設け、前記ICタグは、少なくとも前記切欠きの底よりも高く位置させて収容装着することを特徴とする。尚、ICタグの周波数は、13.56MHzに限定されず、目的の効果が発揮されるものであればよい。

【0007】上記金属製構造物に形成する凹部と外周面とを連通する切欠きは、少なくとも該凹部の底面から上方の周壁の一部を上端まで完全に切除するものとし、具体的には周壁に凹部の内外を連通する溝を1本又は複数本切欠き形成する形態、或いは凹部の中心を構造物の中心に対して偏位させて形成することで、周壁の一部が切欠かれた凹部と切欠きが一体の形態等が挙げられる。即ち、切欠きの大きさは、必要とする感度と、マーカーの強度に合わせて決定する。

【0008】又、凹部と構造物の外周面とを連通する切欠きは、非金属材、例えば合成樹脂材で埋め、プレートを固着することで凹部は密封されるようにする。その切欠きを埋める充填材はそれ自体独立した形態でも良いが、凹部の開口部を閉鎖するプレートに前記切欠き部分を埋める充填材を一体に形成する形態としてもよい。更に、上記切欠きは凹部周囲の周壁のみならず、底部をも貫通して切り欠いてもよい。また、凹部の開口部を閉鎖するプレートは、凹部周囲の周壁上面に接着固定する載置タイプ、或いは凹部内に嵌める嵌合タイプ、載置タイプと嵌合タイプのミックスタイプ等、何れでもよいものである。凹部内に収容するICタグは、四角形の薄いフィルム状をなし、中央にICチップが配置され、外側周辺にアンテナが薄膜で形成されたものである。

【0009】又、ICタグを内蔵した金属製マーカー

は、読取装置と非接触で通信できるアンテナを備えたICタグと、前記ICタグを収納できる凹部とその凹部の周壁に該凹部内と外側面を連通する切欠きを形成した金属製のマーカー本体とを備え、前記ICタグを前記切欠きの底よりも高く位置させて装着する構成とする。上記マーカーは、凹部が形成される頭部の下側に爪部（脚部）が形成されたものに限定されず、対象物等に貼り付けて固定するものであってもよい。

【0010】上記手段によれば、ICタグが収容装着される金属構造物に、ICタグの位置よりも深い凹部と構造物の外周面に到達する切欠きが設けてあるため、電波

(3)

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或いは磁界の通り道が確保される。それにより、金属の影響を受けやすい周波数対応のICタグが金属材に装着されても、読取装置と確実に交信できる。

【0011】

【発明の実施の形態】以下、本発明の実施の形態の一例を図面にに基づき説明する。図1は、土地境界や土木工事等の目印として使用されるマーカー（鉋）にICタグを装着する状態を示し、図中、1は金属製のマーカー本体、2はICタグ、3は非金属材料からなるプレート、4は非金属製の充填材である。

【0012】マーカー本体1は、ステンレスや鉄等の金属材料で、ICタグ2を装着する頭部1aの下面に爪部1bが一体に形成された断面略T字形に形成され、頭部1aにはICタグ2を浮かして収容し得る深さの凹部5が形成され、且つその凹部5の周囲の周壁には、凹部5内から外周面に到達する切欠き（溝）6が切欠形成されている。このマーカー本体1の大きさは、頭部1aの外径が24mm、頭部1aの厚さが6mm、爪部1bの長さが70mmである。爪部1bは地中に埋め込まれてマーカーを固定するもので、その外周面には打ち込みをスムーズにする溝7が形成されている。

【0013】上記凹部5に収容するICタグ2は、四角形の薄いフィルム状をなし、中央にICチップ2aが配置され、外側周辺にはアンテナ2bが薄膜で形成されている。そして、このICタグ2は前記凹部5の底部より浮かして収容するため、該ICタグ2は非金属製のプレート3の裏面に貼り付け固定し、プレート3自身は凹部5内に嵌合して固定する。これにより、ICタグ2は、凹部5の底面から数mm浮いた状態で支持される。

【0014】プレート3は、合成樹脂材等の非金属材料で前記頭部1aの外径と略同径の円板状に形成され、そのプレート3裏面の凹部5に対応する位置にICタグ2を貼り付け固定する。そして、このプレート3の表面には埋設物等の内容を表示する名称8等が表記されている。尚、このプレート3は、図示するように凹部5の周壁5'の上面に載置固定する形態に限定されるものではなく、凹部5の内側に嵌合する内嵌めキャップ状、或いは周壁5'を被う外嵌めキャップ状等でもよいものである。

【0015】上記切欠き6は、前記した凹部6の底面と同一面で周壁5'を所定の幅（例えば、2mm）切欠き、凹部5の内部と周壁5'の外側が連通するように形成されている。そして、この切欠き6は合成樹脂材等の非金属材料からなる充填材4で埋められ、前記したプレート3の固着で凹部5が密封されるようにしてある。尚、この充填材4は、プレート3と一体に構成してもよい。

【0016】図4は、上記切欠き6の他の形態を示し、この切欠き6'は、周壁5'のみでなく凹部5の底部5''も一緒に切り欠いた形態で、切欠き6'は前記したと同様充填材4で埋められる。その他の構成は前記した

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実施の形態と同様であるので、説明は省略する。図5は、凹部5の周壁5'に形成する切欠き6を、周方向に間隔を置いて多数形成した形態で、多数の切欠き部分は前記実施の形態と同様、充填材4で埋められる。

【0017】図6は、マーカー本体の他の例を示し、マーカー本体9の頭部9aの形状が平面略正四角形で、しかもその頭部9aの面積が装着するICタグ2より非常に大きい場合は、ICタグ2を収容する凹部10は頭部9aの中心位置に形成することなく、外周面に近い位置に配置形成する。何故ならば、ICタグ2から頭部9aの外周面までの距離は、短い方が切欠き11を通る距離も短くなり、金属の影響を少なくできる。

【0018】図7は、切欠き6の変形例を示し、平面円形の頭部12に対して形成する平面円形の凹部13を、凹部13の中心Oを頭部12の中心O'より右方向に距離だけ偏位して形成することで、凹部13の形成で外周面に到達する切欠き14を同時に形成することが出来る。そして、凹部13を形成する中心の偏位量を調節することで、切欠き14の幅を広狭調節することが出来る。

【0019】上記構成のICタグ内蔵の金属製マーカーからICタグに記憶されている情報を読み取るには、操作者が携帯する読取装置15をマーカー1の上面に接近（約5mm）、或いは当接させることで、マーカー1に装着されているICタグ2からマーカーを構成する金属の影響を受けることなく、情報を読み取ることが出来る。これは、図2に示すように、読取装置15、ICタグ2のアンテナ、切欠き6、そして読取装置15に戻る磁界が確保されるからである。

【0020】次に、上記構成のマーカーの実験結果について説明する。

【実験使用セット】実験に使用するICタグと読取装置は、周波数が13.56MHzのICタグ単体（周辺に金属材料がない状態）を水平に設置し、そのICタグの中心を通る鉛直線上に沿って読取装置を該ICタグ表面から50mm離しても通信が可能なセットを使用する。

【実験1】図1に示したと同様の構成で、周壁に切欠きが形成されていない金属製マーカーに、周波数が13.56MHzのICタグを前記した状態で装着する。そうしたマーカーの上面に読取装置を接触するまで近づけても、通信は出来ず、読取は出来なかった。

【実験2】上記ICタグを図1に示した切欠きを有する金属製マーカーに装着し、実験1と同様に読取装置を近づけたところ、マーカー上面から読取装置までの距離が5mm離れても、通信が可能で、情報を読み取ることが出来た。尚、前記したICタグ2の支持は、プレート3の裏面に貼り付けることに限らず、凹部5の底に、厚さ数mmで非金属からなるスペーサを介して固着するようにしてもよい。または、切欠きがICタグのアンテナ部の下まで伸びていれば、凹部の底に位置させてもよい。

(4)

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要は、図2に示すような磁界の通路が確保できる形であればよい。

【0021】

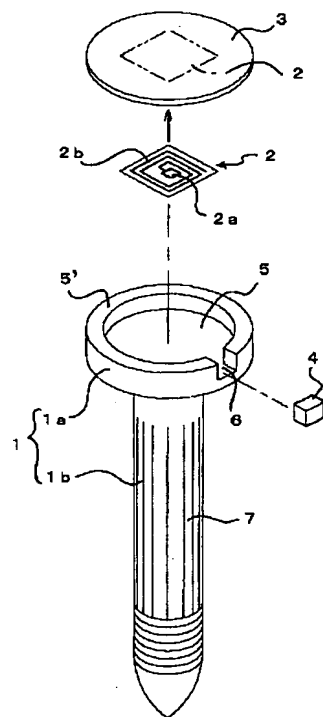
【発明の効果】本発明のICタグの金属物への装着方法は請求項1記載の構成により、金属の影響を受けやすい無線周波数であっても、ICタグと読取装置との通信が可能となり、安価なICタグを金属物に利用可能とすることができる。又、請求項2記載の構成により、金属の影響を受けやすい無線周波数対応のICタグを金属製の

10 マーカーに装着しても通信可能となり、ICタグ内蔵のマーカーを安価に製作することが出来る。

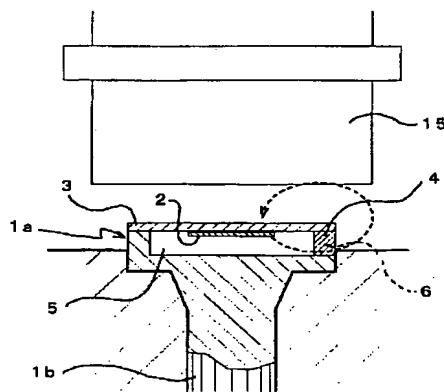
【図面の簡単な説明】

【図1】本発明に係るICタグ内蔵マーカーの実施の形態一例を示す分解斜視図である。

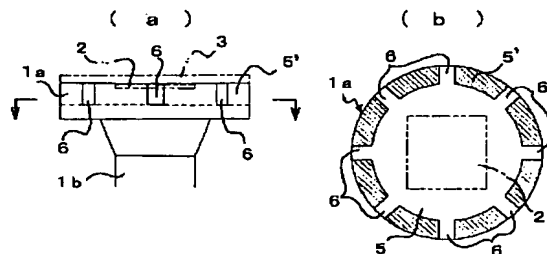
【図1】



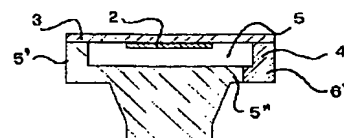
【図2】



【図5】



【図4】



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【図2】使用状態を示す一部切欠側面図である。

【図3】同一部切欠平面図である。

【図4】切欠きの変形例を示す断面図である。

【図5】切欠きの他の例を示し、(a)は正面図、(b)は横断面図である。

【図6】マーカーの変形例を示す斜視図である。

【図7】切欠きの変形例を示し、(a)は横断面図、(b)は縦断面図である。

【符号の説明】

1…マーカー本体

1a…爪部

2b…アンテナ

4…充填材

5a…凹部の周壁

1a…頭部

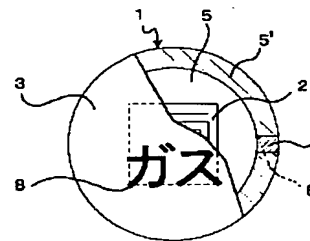
2…ICタグ

3…プレート

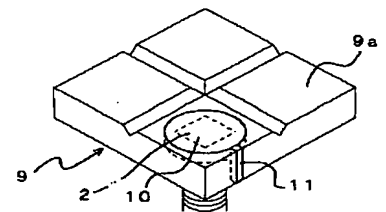
5…凹部

6…切欠き

【図3】

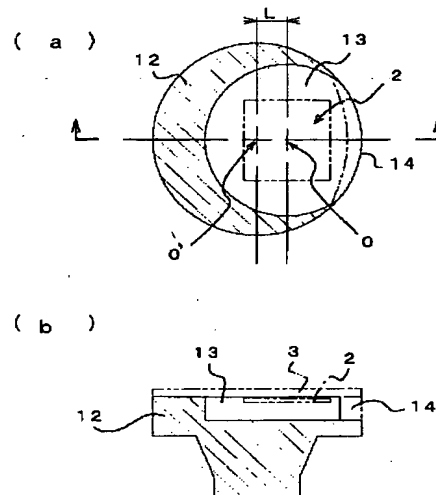


【図6】



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【図7】



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